

WHAT IS CLAIMED IS:

1. A method for determining bit wear in a drill
bit of a drilling rig system comprising:
providing a first drill bit design, the first drill
5 bit design having a first geometry;
generating a geological model of given formation,
the geological model including a geological
characteristic based on a length of formation drilled in
a given amount of time; and
10 predicting the first wear rate of the first drill
bit design based on the first geometry compared to the
geological model for the length of formation drilled.
2. The method of Claim 1, further comprising:
15 incrementing along the length of the formation
drilled of the geological model;
based on the increment, predicting a second wear
rate for the first drill bit; and
cumulating the first wear rate and the second wear
20 rate to determine a total bit wear.
3. The method of Claim 2, further comprising
predicting a cumulative bit wear over the length of the
formation drilled of the geological model.
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4. The method of Claim 1, further comprising:
varying a drilling factor along the geological model
using the first drill bit design;
predicting a second bit wear rate for the first
5 drill bit; and

comparing the second bit wear rate to the first bit
wear rate to determine whether a varied drilling factor
increased the bit wear.

10 5. The method of Claim 4, wherein the drilling
factor is selected from a group consisting of rate of
penetration, weight on bit, torque, rotary rpm and bit
sharpness.

15 6. The method of Claim 2, further comprising:
selecting a second drill bit design, the second
drill bit having a second geometry;

predicting a second bit design wear rate of the
second drill bit design based on the second geometry
20 compared to the geological model for the length of
formation drilled; and

comparing the second bit design wear rate to the
wear rate for the first drill bit design to select a
preferred drill bit design.

25 7. The method of Claim 5, further comprising
displaying the preferred drill bit design.

8. The method of Claim 1, wherein the first and
30 second geometry including a 3D model of a drill bit
design.

9. The method of Claim 1, wherein the geological characteristic is selected from a group consisting of log data, lithology, porosity, rock strength, and plasticity.

5 10. A program product for predicting the performance of drilling system, the program product comprising:

a computer-usable medium; and
computer instructions encoded in the computer-usable
10 medium, wherein the computer instructions, when executed, cause a computer to perform operations comprising:
providing a first drill bit design, the
first drill bit design having a first geometry;
generating a geological model of given
15 formation, the geological model including a geological characteristic based on a length of formation drilled in a given amount of time; and
predicting the first wear rate of the
first drill bit design based on the first geometry
20 compared to the geological model for the length of formation drilled.

11. The program product of Claim 10, wherein the computer instructions further comprising:
25 incrementing along the length of the formation drilled of the geological model;
based on the increment, predicting a second wear rate for the first drill bit; and
cumulating the first wear rate and the second wear
30 rate to determine a total bit wear.

12. The program product of Claim 11, wherein the computer instructions further comprising predicting a cumulative bit wear over the length of the formation drilled of the geological model.

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13. The program product of Claim 10, wherein the computer instructions further comprising:

varying a drilling factor along the geological model using the first drill bit design;

10 predicting a second bit wear rate for the first drill bit; and

comparing the second bit wear rate to the first bit wear rate to determine whether a varied drilling factor increased the bit wear.

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14. The program product of Claim 11, wherein the computer instructions further comprising:

selecting a second drill bit design, the second drill bit having a second geometry;

20 predicting a second bit design wear rate of the second drill bit design based on the second geometry compared to the geological model for the length of formation drilled; and

25 comparing the second bit design wear rate to the wear rate for the first drill bit design to select a preferred drill bit design.

15. The program product of Claim 10, wherein the computer instructions further comprising displaying the preferred drill bit design.

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16. The program product of Claim 10, wherein the first and second geometry including a 3D model of a drill bit design.

5 17. The program product of Claim 10, wherein the computer instructions further comprising generating a real-time wear modeling of a first drill bit design based on a drilling operation.

10 18. A method for using drill bit model for drilling operations comprising:

 providing a drill bit model for a first drill bit;
 simulating a drilling operation for drilling in a given formation using the drill bit model, the given
15 formation having a rock compressive strength;

 based on the simulation, generating at least one parameter for the first drill bit;

 comparing the at least one parameter of the drilling operation of the given formation to a parameter of a
20 second drill bit;

 based on the comparison, selecting a preferred drill bit for drilling the given formation.

 19. The method of Claim 18, wherein the at least
25 one parameter selected from a group consisting of an axial projected contact area, a theoretical work rating, a work rating, a wear characteristic, a cumulative work-wear relationship, a friction slope, a sharp cutting line slope, and a worn cutting line slope.

30 20. The method of Claim 18, wherein the drill bit model comprises a 3-D model of the drill bit.

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21. The method of Claim 18, further comprising
storing the drill bit model on a computer.

22. The method of Claim 18, further comprising
5 displaying the preferred drill bit.